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THE DIRECTOR

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OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE

FOR

1922-1923.

CAMBRIDGE, U. S. A.:

PRINTED FOR THE MUSEUM.

1923.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EAST-
ERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE
U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904,
TO MARCH, 1905, LIEUTENANT COMMANDER L. M. GARRETT, U. S. N.,
COMMANDING, IN PREPARATION:—

R. P. BIGELOW. The Stomatopods.
O. CARLGREN. The Actinaria.
W. R. COE. The Nemerteans.
H. J. HANSEN. The Cirripeds.
W. E. HOYLE. The Cephalopods.
P. KRUMBACH. The Sagittae.

G. W. MÜLLER. The Ostracods.
MARY J. RATHBUN. The Crustacea
Decapoda.
G. O. SARS. The Copepods.
H. R. SIMROTH. Pteropods, Heteropods.
TH. STUDER. The Alcyonaria.

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CAMBRIDGE, MASS.

MUSEUM OF COMPARATIVE ZOÖLOGY.

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ABBOTT LAWRENCE LOWELL, *President*.
HENRY P. WALCOTT. JOHN E. THAYER.
GEORGE R. AGASSIZ. SAMUEL HENSHAW, *Director*.

Officers.

SAMUEL HENSHAW . . . *Director*.
SAMUEL GARMAN . . . *Curator of Reptiles, Amphibians, and Fishes*.
OUTRAM BANGS . . . *Curator of Mammals and Birds*.
HUBERT L. CLARK . . . *Curator of Echinoderms*.
HENRY B. BIGELOW . . . *Curator of Coelenterates*.
ROBERT W. SAYLES . . . *Curator of the Geological Collections*.
PERCY E. RAYMOND . . . *Curator of Invertebrate Palaeontology*.
THOMAS BARBOUR . . . *Associate Curator of Reptiles and Amphibi-
ans*.
RALPH V. CHAMBERLIN . . . *Curator of Arachnids, Myriopods, and Worms*.
JOHN C. PHILLIPS . . . *Associate Curator of Birds*.
NATHAN BANKS . . . *Curator of Insects*.
GEORGE NELSON . . . *Preparator*.

REGINALD A. DALY . . . *Sturgis Hooper Professor of Geology*.

REPORT.

TO THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE:—

PROF. George Lincoln Goodale, a member of the Museum Faculty since 1880, died in Cambridge, 12 April, 1923; Professor Goodale was also an officer of instruction in the University since 1872, retiring as Fisher Professor of Natural History *Emeritus* in 1909. During many years of Museum activity Dr. Goodale, as a member of the Faculty, gave Mr. Agassiz hearty support in the development of the Museum, and thanks to his efforts a sum sufficient for the erection of the central section of the University Museum was obtained for the Botanical Department and Museum; he administered the latter with such notable success that its exhibition rooms are today the outstanding popular attraction of the University.

A fund of \$10,000.—“The William and Adelaide Barbour Fund,” due to the filial generosity of Dr. Thomas Barbour, allows “the income to be expended wholly at the discretion of the Director of the Museum of Comparative Zoölogy * * * to provide additional means to increase the collections of the Museum either by exploration or the purchase of desirable material.”

The most noteworthy field-work of the year is that of Dr. E. R. Dunn in Middle America; his collections, mostly herpetological, in addition to the discovery of new forms, increase our knowledge of the life histories, variation, and distribution of previously described species. Dr. Dunn’s work, as in recent years, is undertaken through the coöperation of Dr. Thomas Barbour.

The scientific results of the U. S. Bureau of Fisheries in the Gulf of Maine and of the International Ice Patrol of the Grand Banks continue under the general supervision of Dr. H. B. Bigelow. The study of the data from both of these explorations is progressing satisfactorily.

Mr. Banks and Mr. Nelson collected in Massachusetts and Florida, and though Dr. Clark’s attempt to obtain several species of echinoderms described seventy years ago from the vicinity of

Charleston, S. C. proved futile, owing to the altered conditions of the sea coast, it is expected that from a newly aroused interest, his visit will not have been altogether without results.

The collections made by Mr. F. R. Wulsin in China, mentioned in last year's Report, added a number of mammals and birds new to the Museum.

Dr. G. M. Allen's curatorial work upon the collection of mammals has been continuous throughout the year. He has attended to the cataloguing and tentative identification of new accessions, to exchanges, and loans, and has aided the researches of visiting investigators. The more important of his own studies include the preparation and report upon the rare porpoise, *Meomeris*, one of the most interesting results of Mr. F. R. Wulsin's recent work in China. In collaboration with Mr. G. S. Miller, Jr., Dr. Allen has undertaken a revision of the species of *Myotis*. For the study of this difficult genus of bats, the collections of the British Museum, the U. S. National Museum, and the University of California are available; this work is well under way. An arrangement has been effected with the American Museum of Natural History for Dr. Allen to prepare for publication a report upon the mammals collected by that Museum's Asiatic expedition. The study of the Chiroptera is nearly completed. In return for this coöperative service, the Museum will receive considerable additions to its collections from localities not well represented at present.

Mr. W. F. Clapp's three months' (August-October) work upon the collection of Mollusca dealt with recent accessions. For the last eleven years, since September, 1911, Mr. Clapp has been practically in charge of the collection of Mollusca, and during that time, its very considerable growth and its entire rearrangement was mainly due to his enthusiasm and industry.

Though the larger part of the time of the Museum Preparator, Mr. George Nelson, is given to the preservation and repair of material for the research collections, and to photographic and mechanical work for the Curators, a few mounts are added each year to the Exhibition rooms. The two Moose, for the North American collection, mentioned in last year's Report, the Whale-head or Shoe-bill (*Balaeniceps rex* Gould) for the African room, and the Drum (*Pogonias cromis* (Linné)) for the series of North Ameri-

can fishes, are the more notable of the additions this year. Distributed throughout the Systematic collection and the Faunal rooms of the Museum, the amount and effectiveness of Mr. Nelson's work is not always obvious.

For the services of Mr. James L. Peters, the Museum is indebted to a number of its friendly patrons. For several months, Mr. Peters has been making a card catalogue of the collection of bird skins. He has completed the record of twenty-two (22) families, containing 472 species and 7,536 specimens.

For voluntary curatorial work, incidental to their studies upon the collections, the Museum is indebted to Mr. T. E. Penard (birds), Dr. Anfranio do Amaral (reptiles), Dr. E. R. Dunn (reptiles and amphibians), and Miss E. B. Bryant (spiders).

As the collections are sufficiently worked over to allow an approximate statement of their extent, it is of interest to note, from time to time, their status and growth. Using the Sharpe Hand-list of birds as a basis for families and genera of recent forms, the Museum contains representatives of all the families, and lacks 284 genera from a total of 2,652; a conservative estimate of the number of species would be 12,000.

For reptiles and amphibians, Dr. Barbour's record is 583 genera, and 3,393 species, and for echinoderms, the collection contains (Dr. Clark's record) 542 genera, 2,457 species, and 92,150 specimens.

To Mr. Samuel E. Cassino, the Museum is indebted for a large collection, more than 10,000 specimens, of Lepidoptera, mostly butterflies. This collection belonged at one time to Mr. Jacob Doll; the specimens are in exceptional condition and for the greatest part specifically identified.

The Museum is also indebted to Mr. Homer L. Bigelow for a series of about 3,000 specimens of skins of North American birds, chiefly from Newfoundland, North Dakota, Colorado, Arizona, and California. This series collected and prepared by Mr. Bigelow is in especially fine condition.

Dr. Thomas Barbour's donations include a large series of Javan invertebrates, mostly insects, arachnids, and myriopods, collected a few years ago by Messrs. William Palmer and Owen Bryant, a series of Antarctic birds, and several hundred mammals and birds

from China, Venezuela, Panama, Costa Rica, and Florida. In addition to the above, it should be noted that Dr. Barbour improves every opportunity, through exchange and purchase, to increase the scientific importance of the collection of amphibians and reptiles; these additions are frequently large.

Professors Daly and Palache, while engaged in geological work in South Africa (Shaler Memorial Expedition), secured for the Museum a number of zoölogical specimens and a few fossils, most of which are new to the collection. Professor Daly also interested some residents in St. Helena and South Africa in the work of the Museum.

The Museum has to thank Prof. Maynard M. Metcalf for a series of 161 slides, (including 106 paratypes), of species of ciliate Infusoria (Opalinidae), described in a recently issued Bulletin (120) of the U. S. National Museum.

The Museum is also indebted to Prof. C. H. Smyth for a slab of limestone from the Steep Rock series, Canada, which shows one of the oldest Pre-Cambrian fossils.

To Mrs. C. W. Townsend for a new species of Dalmanites from the Devonian of Gaspé.

To Mr. J. C. Chamberlin for a series of Chelifers, including a number of paratypes.

To the Zoölogical department of the University of Iowa for the types of six species of spiders from Antigua and Barbados, described by Miss E. B. Bryant.

To Mr. F. C. Bowditch for a series of Chrysomelidae.

To Prof. H. H. Wilder for the type of *Hynobius kimurai*.

To Dr. Anfranio do Amaral for many Brazilian snakes.

To Mr. Arthur F. Gray for a collection of nests and eggs of birds.

To Mr. T. E. Penard for the types of five birds from Surinam, which he recently described.

To Mr. Irving K. Taylor for a specimen of the Shoe-bill (*Balaeniceps rex* Gould).

To Mr. John E. Thayer for some original drawings of Alexander Wilson, and for a series of photographs illustrative of the habitat of the Great Auk at Funk Island.

The Museum has also received additions for which separate mention should be made,

By gift:—

Dr. John C. Phillips, Mammals and birds.

Dr. L. C. Sanford, Birds.

The New York Zoölogical Society, Messrs. J. C. Moulton, and R. J. Tillyard, Reptiles.

Mr. A. C. Kinsey, Cynipidae.

Mr. G. S. Dodds, Colorado Trichoptera.

Mr. D. Thaanum, Hawaiian sea-urchins.

U. S. Bureau of Fisheries, Medusae and samples of towings.

Yale University, Cambrian trilobites.

Dr. T. H. Clark, Types of new fossil invertebrates.

Mr. W. F. Eastman, Cretaceous and Tertiary fossils from Egypt.

Mr. I. A. Ettlinger, Fossils from the Devonian and Mississippian of Arizona, and the Cambrian and Pennsylvanian of Colorado.

The Johns-Manville Company, Asbestos for the Geological collection.

Mr. Hugh Nawn, Fossil bark of a Devonian tree from Gilboa, also for the Geological collection.

By exchange:—

With the U. S. National Museum and the Zoölogical Museum of the University of Michigan (mammals, reptiles, and amphibians).

With the British Museum (Natural History), the Naturhistorisches Museum (Basel and Frankfurt a. M.), Albany Museum (Grahamstown), Museo Nacional de Historia Natural (Buenos Aires), American Museum of Natural History, Field Museum, and the California Academy of Sciences (reptiles and amphibians).

With the Muséum d'Histoire Naturelle, Paris, (spiders).

With the Transvaal Museum (spiders and scorpions).

By purchase:—

An identified series of European and South American spiders (Dr. Edward Reimoser).

A collection of myriopods from many parts of the world, including a number of types (Prof. Graf Carl Attems).

A series of 134 species, 673 specimens of Odonata from Middle and South America (Mr. J. H. Williamson).

A number of birds peculiar to Madagascar, including a series of bones of Aepyornis and Müllerornis (Mr. Charles Lamberton).

West African vertebrates and invertebrates (Mr. George Schwab).

To the generosity of Dr. Howard A. Kelly, the Museum is indebted for a copy of the second edition of H. Kirke Swann's Synopsis of the Accipitres. This copy, number 5 of the twelve privately printed, large paper issue, is illustrated by 77 coloured plates of birds and their eggs.

The collection of original paintings and drawings of animals in the Museum library has received the following noteworthy additions during the year: a pencil sketch of a Scorpion by John Singer Sargent, and a Canada Goose, a water-color by Frank W. Benson, both the gift of the artists; a group of Mallards, a water-color by Archibald Thorburn and a Phoebe also a water-color of Charles Heil are the gift of Dr. John C. Phillips, and to Dr. Thomas Barbour the Museum is indebted for two characteristic pencil sketches by John La Farge and a number of water-colors of birds, the work of Allan Brooks.

The Library contains 61,060 volumes, and 66,965 pamphlets; 1,214 volumes and 1,712 pamphlets have been received during the year.

The publications for the year include five numbers of the Bulletin and the Annual Report, a total of 188 pages and three plates.

SAMUEL HENSHAW,
Director.

REPORT ON THE MAMMALS.

BY OUTRAM BANGS.

During the year 271 specimens were received.

Although no large collections were received, among the small series and single specimens, there are many that fill important gaps. The accessions include:— 26 specimens from the Cameroons, purchased from Mr. George Schwab, 39 from China, also a purchase, from the F. R. Wulsin Chinese expedition, and 92 specimens by exchange with the U. S. National Museum, the Instituto la Salle, and the University of Michigan.

Single specimens or small series were received from Mr. W. C. Adams, Drs. G. M. Allen, Thomas Barbour, Messrs. H. L. Bigelow, W. Burns, C. H. Kidder, S. K. Lothrop, George Nelson, Prof. Charles Palache, Mr. T. E. Penard, Dr. J. C. Phillips, Mr. M. W. Raymenton, and Dr. C. W. Townsend.

REPORT ON THE BIRDS.

BY OUTRAM BANGS.

During the year 4,228 specimens were received.

A very fine collection, the private collection of Mr. Homer L. Bigelow, numbering about 3,000 beautifully prepared skins, mostly from California, North Dakota, Newfoundland, Arizona, and Colorado, most generously presented by Mr. Bigelow, 366 birds mostly from Fukien, a gift of Dr. Thomas Barbour, and 130 skins from Chihli (F. R. Wulsin Chinese expedition), comprise the more important additions.

Small series or single skins, from many parts of the world, have been received from Dr. G. M. Allen, Mr. Outram Bangs, Dr. Thomas Barbour, Mr. A. C. Bent, Dr. H. B. Bigelow, Messrs. H. S. Blair, C. P. Curtis, R. L. Fisher, E. H. Forbush, Dr. W. T. Grenfell, Messrs. Arthur Hands, Samuel Henshaw, F. H. Kennard, D. B. McMillan, C. F. Mason, T. E. Penard, Drs. J. C. Phillips, L. C. Sanford, Messrs. George Schwab, W. A. Taylor, Dr. C. W. Townsend, and Mr. F. S. Wright.

Mr. T. E. Penard has presented the types of *Leptotila verreauxi tenella*, *Milvago chimachima paludivaga*, *Empidonax lawrencei nemoralis*, *Sporophila schistacea arthuri*, and *Tanagra chrysopasta nitida*, all from Surinam, and lately described by him.

During the year thirty-nine genera, new to the collection, have been obtained, and also a number of species that fill gaps in our series, including many that are rare or local, (*Thryospiza mirabilis*, *Pyrrhura murina*, and *Leucopoliis sanctae helenae*, etc.).

Exchanges have been made with a number of institutions, and as usual, much material has been loaned.

Mr. J. L. Peters is engaged in the preparation of a card catalogue of the collection. Mr. F. H. Kennard and Mr. T. E. Penard continue their studies in the Department.

REPORT ON THE REPTILES AND AMPHIBIANS.

BY THOMAS BARBOUR.

For nearly a year Dr. Anfranio do Amaral, of Butantan, Brazil, has been a student at the Museum and the collection has been greatly improved by his critical studies of many obscure South American snakes, and he has likewise contributed many of his authoritatively determined specimens. Dr. G. M. Allen has likewise helped with the catalogues.

Specimens were received by gift from the following sources:—Hermano Claudio, Prof. H. H. Wilder (the type of *Hynobius kimurai*), Dr. R. J. Tillyard, the Field Museum, University of Michigan Museum, the New York Zoölogical Society, Major J. C. Moulton, Prof. T. W. Chapman, Mr. W. S. Brooks, Major Allan Brooks, Mr. James Zetek, the Charleston Museum, Mr. F. Zerban Brown, Dr. J. C. Phillips, and Prof. Charles Palache.

Exchanges were made with the American Museum of Natural History, the British Museum (Natural History), the California Academy of Sciences, the University of Michigan Museum, the Field Museum of Natural History, the Albany Museum, Grahamstown, the United States National Museum, the National Natural History Museum, Buenos Aires, the Senckenberg Museum, the Natural History Museum, Basel, Switzerland.

Material has been purchased from many sources.

Various naturalists have loaned or borrowed specimens and a number have visited for varying lengths of time. Dr. E. R. Dunn makes frequent use of the collection and his work upon it has greatly increased its value.

A census of the collection is appended hereto:—

| | | | | |
|-----------------|--------|-----|---------|------|
| Rhynchocephalia | Genera | 1 | Species | 1 |
| Crocodylia | " | 6 | " | 18 |
| Chelonia | " | 41 | " | 147 |
| Lacertilia | " | 226 | " | 1317 |
| Ophidia | " | 149 | " | 1020 |
| Amphibia Apoda | " | 10 | " | 19 |
| Urodela | " | 35 | " | 140 |
| Salientia | " | 115 | " | 731 |

The collection contains 94 species of toads (*Bufo*), 114 species of tree frogs (*Hyla*), and 127 species of frogs (*Rana*).

The collection now represents 583 genera and 3,393 species. These numbers will be materially increased when all of the species are critically revised and the many recent accessions incorporated in the study series.

REPORT ON THE FISHES.

BY SAMUEL GARMAN.

Work on the fishes has been continuous throughout the year.

With age the necessity of frequent inspection becomes more noticeable, especially among the smaller receptacles.

Identifications, verifications, restoration for evaporations, and reductions of the useless among duplicates go hand in hand.

Numerous dissections to determine food, habits, or peculiarities are productive of delay.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

BY NATHAN BANKS.

Additional material has been received from Messrs. George Barber, Thomas Barbour, William Barnes, F. C. Bowditch, W. J. Clench, C. A. Frost, Harrison Garman, C. H. Kennedy, A. C. Kinsey, H. H. Knight, A. W. Lindsey, J. McDunnough, Henry Skinner, T. E. Snyder, L. W. Swett, E. B. and J. H. Williamson, and F. R. Wulsin.

Particularly valuable are the Bryant collection of Javanese insects presented by Dr. Barbour, the Neotropical Odonata from the Williamsons, and the types of galls and cynipids from Mr. Kinsey.

Exchanges with the Canadian National Museum, Mr. F. C. Cole and C. B. Garrett have added species to the Diptera and Neuroptera. The Colorado Trichoptera sent by Prof. G. S. Dodds is most welcome, as it contained larvae and pupae of many species.

The Curator has added several hundred local specimens.

Mr. S. E. Cassino has given the Doll collection. This contains about 11,000 specimens of Lepidoptera, chiefly butterflies, in excellent condition, mostly named, and from all parts of the world.

Collections have been named for the Minnesota Agricultural College, Mississippi Agricultural College, Messrs. A. W. Lindsey, O. Stevens, R. C. Smith, G. F. Mozzette, and G. S. Dodds, from all of which we have retained desirable specimens.

Mr. R. F. Hussey has identified various Lygaeidae; Mr. T. H. Hubbell many Oecanthus and some other Orthoptera; the Miltoigramminae have been studied by Mr. Allen, two genera and the Nebraska specimens of Cicadellidae were sent to Mr. Lawson, the Bolbocerasoma to Mr. Dawson, and Dr. R. H. Howe has identified the nymphs of various Odonata.

In the course of rearrangement of the Neuroptera descriptions

were prepared of numerous new species, and much material has been named in the Diptera. About 500 types have been verified and marked; there are now about 970 in the Lepidoptera and 90 in the Thysanura. Collection labels have been placed on several thousand of the Morse Orthoptera, and species labels on many Diptera.

The usual number of visitors was increased by over twenty during the meetings of the A. A. A. S.

The serious shortage of boxes has prevented any considerable amount of rearrangement or incorporation of new material. Mayflies, psocids, and some Perlidae have been put in new boxes, but the Neuroptera is still unfinished, and the Morse Orthoptera, Bowditch Coleoptera, Banks Diptera, and much exotic material is still in need of transfer to safe boxes.

REPORT ON THE MYRIOPODS, ARACHNIDS, AND WORMS.

BY RALPH V. CHAMBERLIN.

Some weeks at the beginning of the year were devoted to rearranging the collection of myriopods and to interpolating recently identified material. Many small lots of myriopods which had been accumulated during recent years were labeled in connection with this work.

The Curator gave several months to work on the collection of spiders made by the expedition of the California Academy of Sciences to the islands and shores of the Gulf of California in 1921, and completed a report upon the same. In conjunction with this work he identified much material from adjacent regions.

Prof. C. R. Crosby, with Mr. J. W. Force as his artist, was at the Museum during November and December, engaged in studying the Erigoninae and in illustrating types of species for a forthcoming monograph of this group. With his coöperation a considerable amount of previously unworked material was identified and labeled.

An important series of arachnids, chiefly South American, was purchased of Dr. Edward Reimoser. Professor Crosby gave a specimen of *Archaea workmani* Cambridge and Professor V. M. Tanner presented arachnids from southern Utah.

During the latter part of the year a beginning was made on a study of the myriopods secured by the expedition of the American Museum to the Belgian Congo. Identifications of miscellaneous smaller collections were made for the U. S. Bureau of Entomology, the U. S. Horticultural Board, the Biological Survey, the University of Arizona, the University of California, the University of Arkansas, the Mountain Laboratory of the Carnegie Institution in Colorado, and others. In most cases specimens thus identified were given to the Museum.

REPORT ON THE ECHINODERMS.

BY HUBERT LYMAN CLARK.

During the first half of the year, most of the time was spent in preparation of a report on the Museum collection of Synaptinae, a number of new species being described. Since the completion of that work considerable time has been given to the study of sea-urchins from South Africa. The curatorial work of the year has consisted chiefly in the thorough examination of the dry sea-stars and brittle-stars, in search of museum pests, (none being found) and in some rearrangement and relabeling of parts of those collections. Considerable relabeling and recataloguing of holothurians has also been done.

The first half of April was spent in Charleston, S. C., in the hope of securing specimens of the brittle-stars and holothurians described from there in 1852, but local conditions have changed so much, particularly as a result of the establishment of an oil refinery and the use of oil by motor vessels, that no living echinoderms were found save at one point near the northern end of Sullivan's Island, and none of the desired species were obtained. Some donations were, however, received and one remarkable fossil sea-urchin was loaned for description. A report on this specimen and an equally remarkable recent sea-urchin from the China Sea, the gift of Mr. P. Thiery, has been published.

The accessions of the year were 454 specimens of 13 species, of which 2 species were new to the collection, each representing a genus also new to the collection. Aside from the material brought back from Charleston, the chief accession was a gift of 225 Hawaiian sea-urchins from Mr. D. Thaanum, and Dr. J. D. F. Gilchrist of Cape Town sent a specimen of the remarkable pelagic holothurian, *Planktothuria*, recently described by him. Other donors were Dr. S. J. Mixter and Mr. W. G. Mazyck.

As no figures, showing the growth of the collections, have been published since 1917, the following table is appended:—

| | Genera | Species | Specimens |
|--------------|--------|---------|-----------|
| Crinoids | 51 | 177 | 3,023 |
| Asteroids | 141 | 608 | 13,408 |
| Ophiurans | 149 | 804 | 25,497 |
| Echini | 135 | 475 | 44,324 |
| Holothurians | 66 | 393 | 5,898 |
| | <hr/> | <hr/> | <hr/> |
| Totals | 542 | 2,457 | 92,150 |

REPORT ON THE COELENTERATES.

BY HENRY B. BIGELOW.

There have been no important accessions to the collection during the year, but a large series of Chesapeake Bay Medusae has been received from the U. S. Bureau of Fisheries for study and report, supplementing the collection mentioned in the Annual Report M. C. Z., 1921-1922, p. 18. The Museum is also indebted to the Bureau for samples of the tow-nettings made in the Gulf of Maine by the HALCYON in 1920-1921.

In connection with the explorations of the Gulf of Maine, the HALCYON, in my charge, towed and took temperatures in the Massachusetts Bay region in August. It should be recorded that analyses of the nitrogen in some of the bottom samples, collected in the Gulf by the HALCYON in 1921, have been made by Mr. R. K. Bailey, of the U. S. G. S., and that Dr. R. C. Wells, also of the U. S. G. S., has determined the silica contents in samples of sea water collected at Gloucester monthly, December 1920-November 1921.

Most of my time has been devoted to the completion of the report on the fishes of the Gulf of Maine (*cf.* Report, M. C. Z., 1921-1922, p. 18); the sections on the physical characteristics and on the general biology of the Gulf are in course of preparation.

As in past years, I have directed the scientific program of the International Ice Patrol of the Grand Banks. Lieut. E. H. Smith, U. S. C. G., and Mr. E. F. B. Fries, as students in the Graduate School of the University, have prepared the report on the operations of the current season. The oceanographic data, so far gathered, have largely elucidated the mutual relationships of the Labrador and Gulf Stream currents, and the movements of ice in the neighborhood of the Newfoundland Banks, and extensive collections have been made of the animal and vegetable plankton of the cold

and of the warm waters which mingle there. The detailed study of these collections has commenced with Mr. Fries working over the chaetognaths.

Nearly 30% of the drift-bottles set afloat during the summer of 1922, (*cf.* Report M. C. Z., 1921-1922, p. 18), have been recovered. The courses followed by those which were released south of Cape Cod have proved easy to trace; but the circulation of the Gulf of Maine is so complex that a second series of drift-bottles will be released.

The International Committee on Marine Fisheries Investigations, having recommended that the tagging of cod and other fish be undertaken on a large scale off the North Atlantic Coast, the Bureau of Fisheries detailed the HALCYON for this work in April, and since that time about 10,000 cod and other fish have been tagged, and released, most of them in the vicinity of Nantucket Shoals.

REPORT ON INVERTEBRATE PALAEONTOLOGY.

BY P. E. RAYMOND.

The chief work of the year has been the study and description of the trilobites of three new faunas of Upper Cambrian and Lower Ordovician age discovered by Mr. Arthur Keith of the U. S. G. S. during his work in northern Vermont, and collected by Professors Schuchert and Dunbar of Yale University. The Upper Cambrian fauna contains about fifty species of trilobites, which form a very novel assemblage, nearly all being new species, and many belonging to genera previously undescribed. The Museum will receive a large number of additions from this collection. In connection with this work, the Curator also described some of the trilobites in the M. C. Z. collection obtained many years ago by Jules Marcou from the conglomerates at Levis, Quebec.

Professors Palache and Daly obtained in South Africa a few Devonian trilobites which were new or showed novel features. These were described, as was also a new *Dalmanites* from the Devonian of Gaspé, presented by Mrs. C. W. Townsend. An especially important accession is a large slab of limestone from the Steep Rock series at Steep Rock Lake, Canada, presented by Prof. H. L. Smyth. This slab is made up largely of a fossil similar to *Atikokania irregularis* Walcott. One of a number of thin sections of this fossil retains the original structure, which is largely lost through silicification, and throws new light on the nature of this, one of the oldest of Pre-Cambrian fossils. Owing to the difficulty of obtaining well-preserved portions of the material, this investigation is still in progress.

Dr. T. H. Clark continued the study and description of the fauna of the Levis formation, using both the material collected by himself and deposited in the Museum, and the older collection of Marcou. He has described many new fossils and has had some of

them figured. Dr. Clark also published the description of some new fossils from the vicinity of Boston, and gave the types, one of them a new genus and species of trilobite, to the Museum.

Other accessions, not mentioned above, are the following, for which we have to thank the donors:—from Mr. Walter F. Eastman, Cretaceous and Tertiary specimens collected by him in Egypt, Mr. Dilworth S. Hager, Tertiary specimens from Texas, Mr. I. A. Ettlinger, Devonian and Mississippian specimens from Arizona, and Cambrian and Pennsylvanian material from Colorado, Professors Palache and Daly, Devonian and Tertiary material from South Africa, and Carboniferous specimens from Scotland.

REPORT ON THE GEOLOGICAL COLLECTIONS.

BY R. W. SAYLES.

During the past year the collections have been added to materially. The Johns-Manville Company very kindly furnished 135 specimens of asbestos and the manufactured products of asbestos and provided for the arrangement of the exhibit. Professor Palache gave fourteen specimens of the South African asbestos, from the Prieska district, Transvaal, collected during the Shaler Memorial Expedition of 1921-1922. The varieties crocidolite, chrysotile, and amphibolite are noteworthy for their extremely long fibres. Mr. Hugh Naun gave a splendid specimen of fossil bark of a Devonian tree from Gilboa, thus adding to his previous gift.

The supposed coal, found by the Curator in the peat deposit at Nauset Life Saving Station, Cape Cod, proves, according to Prof. E. C. Jeffrey, to be dopplerite, the first report of its occurrence in this country.

In August a study of the Nauset peat and underlying glacial deposits was made, to determine the age of the peat. The peat was deposited in a syncline formed by ice pressure, with dune sand above the peat, showing that the peat did not take part in the folding but was deposited afterwards, during Post-Wisconsin time. In the fall experiments were made on the rate of deposition in marine waters, for the Committee on sedimentation of the National Research Council, and at the annual meeting of the American Association for the Advancement of Science, held in Boston and Cambridge in December papers on the Squantum tillite and on seasonal banding in argillites were given.

In March specimens of eolian and marine rock were collected in Bermuda; a study of their formation suggests that the six or seven soil strata intercalated between thick eolian deposits might mean

times of warm humid climate, such as now prevail in Bermuda, separated by colder, windier climates as represented by the eolian deposits. In other words glacial and interglacial conditions. In July a study of the thick clay varves found near Hanover, N. H., to determine the continuity of deposits representing changes in stream flow in the summer components of the banding, was made.

REPORT ON THE LIBRARY.

During the Museum year from August 1, 1922, to July 31, 1923, inclusive, 1,214 volumes, 2,174 parts of volumes, and 1,712 pamphlets have been added to the Library.

The total number of volumes in the Library is 61,060, the total number of pamphlets is 66,965.

Two hundred and nine volumes have been bound; one thousand two hundred pamphlets have been separately bound.

The William Brewster bequest has added 2,093 titles to the Library, that of Walter Faxon 1,708. The total number catalogued from the G. F. Becker library is 808, but there is a very considerable number of books and pamphlets the final disposition of which has not been determined.

From the Harvard College Library, the Museum has received 349 titles; other contributors are Nathan Banks, (315 titles), W. M. Davis, (147 titles), Samuel Henshaw, (129 titles), Outram Bangs, (68 titles), Thomas Barbour, (42 titles), H. B. Bigelow, (28 titles), R. A. Daly, (26 titles), Peabody Museum of American Archaeology and Ethnology, (26 titles).

PUBLICATIONS

FOR THE YEAR 1922-1923.

(1 AUGUST 1922 — 31 JULY, 1923).

MUSEUM OF COMPARATIVE ZOOLOGY.

BULLETIN: —

Vol. LXV.

- No. 6. Birds from Darien. By Outram Bangs and Thomas Barbour.
42 pp. September, 1922.
- No. 7. The black finless porpoise, *Meomeris*. By Glover M. Allen.
26 pp. 3 plates. January, 1923.
- No. 8. Mammals from Darien. By Glover M. Allen and Thomas Barbour.
18 pp. February, 1923.
- No. 9. Notes on some summer birds of northern Patagonia. By James L. Peters. 64 pp. May, 1923.
- No. 10. Two new genera of sea-urchins. By Hubert Lyman Clark.
10 pp. July, 1923.

REPORT: —

1921-1922. 28 pp. December, 1922.

ALLEN, G. M.

- Bats from New Mexico and Arizona. *Journ. mammalogy*, **3**, p. 156-162.
- A new shrew from Colombia. *Proc. N. E. zool. club*, 12 February, 1923, **8**, p. 37-38.
- The red bat in Bermuda. *Journ. mammalogy*, February, 1923, p. 61.
- The Pampa fox of the Bogota Savanna. *Proc. Biol. soc. Washington*, 28 March, 1923, **36**, p. 55-57.
- See also *Bull.* **65**, no. 7, 8.

BANGS, OUTRAM.

- The identity of *Attila flammulatus* Lafresnaye. [With T. E. Penard]. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 223-224.

The type of *Pachyramphus polychopterus* (Vieillot). [With T. E. Penard]. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 225.

A new name for the rufous-chested flycatcher. [With T. E. Penard]. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 225.

The identity of *Hylophilus leucophrys* Lafresnaye. [With T. E. Penard]. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 226.

A new bulbul from Fukien, China. [With T. E. Penard]. *Proc. N. E. Zool. club*, 27 February, 1923, **8**, p. 41-42.

A new Merops from Java. [With T. E. Penard]. *Proc. N. E. zool. club*, 27 February, 1923, **8**, p. 43.

See also p. 26. *Bull.* **65**, no. 6.

BANKS, NATHAN.

Notes and descriptions of some fossorial Hymenoptera. *Canad. ent.*, January, 1923, **55**, p. 21-22.

Trichoptera, Mecoptera, Arachnida. [Pribilof islands, Alaska]. *North Amer. fauna*, 20 June, 1923, no. 46, p. 146, 158, 237-239, pl. 9.

BARBOUR, THOMAS.

Further remarks on the Chinese alligator. *Proc. N. E. zool. club*, 2 September, 1922, **8**, p. 31-34.

Three new neotropical Salientia. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 111-114.

A new snake from southwest Africa. *Proc. Biol. soc. Washington*, 12 December, 1922, **35**, p. 229-230.

The range of *Rana goliath*. *Copeia*, 20 January, 1923, no. 114, p. 6-7.

Notes on reptiles and amphibians from Panama. *Occ. papers Mus. zool. Univ. Mich.*, 25 January, 1923, no. 129, p. 1-16.

The crocodile in Florida. *Occ. papers Mus. zool. Univ. Mich.*, 10 February, 1923, no. 131, p. 1-6.

West Indian investigations of 1922. *Occ. papers Mus. zool. Univ. Mich.*, 10 February, 1923, no. 132, p. 1-9.

Reptiles in the East and West Indies — and some digression. *Amer. nat.*, March-April, 1923, **57**, p. 125-128.

The Sapo mountains and the Sambri valley. A biological reconnaissance in southeastern Panama. [With W. S. Brooks]. *Geogr. rev.*, April, 1923, **13**, p. 211-222, 8 figs.

The reappearance of *Batrachyla longipes*. *Proc. N. E. zool. club*, 5 June, 1923, **8**, p. 81-83.

The birds of Cuba. *Mem. 6 Nuttall ornith. club*, June, 1923, 141 pp., 4 pls.

A natural history of the ducks, by John Charles Phillips. [Review]. *Harvard grad. mag.*, June, 1923, **31**, p. 604-605.

The frogs of the Fiji islands. *Proc. Acad. nat. sci. Phila.*, 1923, **75**, p. 111-115.

See also p. 26. *Bull.* **65**, no. 6, [With Outram Bangs]. *Bull.* **65**, no. 8. [With Glover M. Allen].

CHAMBERLIN, R. V.

The present attack on the doctrine of evolution. *Bull. W. H. Chamberlin phil. assoc.*, September, 1922, **1**, p. 1-45.

The North American spiders of the family Gnaphosidae. *Proc. Biol. soc. Washington*, 17 October, 1922, **35**, p. 145-171.

Results of the Bryant Walker expeditions of the University of Michigan to Colombia, 1913, and British Guiana, 1914. The Diplopoda. *Occ. papers Mus. zool. Univ. Mich.*, 10 February, 1923, no. 133, p. 1-[143].

Two diplopod immigrants taken at Honolulu. *Proc. Biol. soc. Washington*, 1 May, 1923, **36**, p. 165-167.

Chilopoda. [Pribilof islands, Alaska]. *North Amer. fauna*, 20 June, 1923, no. 46, p. 240-244.

On chilopods and diplopods from islands in the Gulf of California. *Proc. Cal. acad. sci.*, 21 July, 1923, ser. 4, **12**, p. 389-407, 47 figs.

CLARK, H. L.

Misuse of the questionnaire. *Science*, 17 November, 1922, **56**, p. 573.

The echinoderm fauna of South Africa. *Ann. S. African mus.*, May, 1923, **13**, p. 221-435, pl. 8-23.

The distribution and derivation of some New England echinoderms. *Amer. nat.*, May-June, 1923, **57**, p. 229-237.

Some echinoderms from West Australia. *Journ. Linn. soc. London*, 5 June, 1923, **35**, p. 229-251, pl. 13.

See also p. 26. *Bull.* **65**, no. 10.

PHILLIPS, J. C.

A natural history of the ducks. Vol. 1. Boston, etc., 1922, [11], 264 pp., 18 pls.

Adventures in growing tobacco or How not to be a farmer. *Harvard grad. mag.*, June, 1923, **31**, p. 473-487.

RAYMOND, P. E.

Trenton of central Tennessee and Kentucky. *Bull. Geol. soc. America*, 30 September, 1922, **33**, p. 571-586.

New fossils from the Chapman sandstone. *Proc. Boston soc. nat. hist.*, June, 1923, **36**, p. 467-472, pl. 6.

SAYLES, R. W.

Seasonal deposition in marine waters. *Rept. Committee sedimentation Nat. research council*, 1923, p. 61-62.

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE.

| | |
|---|--------------|
| Gray Fund (1859) | \$50,000.00 |
| Permanent Fund (1859) | 117,469.34 |
| Sturgis Hooper Fund (1865) | 108,476.69 |
| Humboldt Fund (1869) | 9,446.59 |
| Agassiz Memorial Fund (1875) | 297,933.10 |
| Teachers and Pupils Fund (1875) | 7,594.01 |
| Virginia Barret Gibbs Fund (1892) | 8,102.47 |
| Willard Peele Hunnewell Memorial Fund (1901) | 5,594.57 |
| Maria Whitney Fund (1907) | 7,561.73 |
| Alexander Agassiz Fund (1910) | 99,500.00 |
| Alexander Agassiz Expedition Fund (1910) | 99,596.26 |
| George Russell Agassiz Fund (1911) | 50,000.00 |
| George Russell Agassiz Fund. Special (1912) | 50,000.00 |
| Maria Whitney and James Lyman Whitney Fund (1912) | 872.16 |
| Louis Cabot Fund (1917) | 6,223.08 |
| William and Adelaide Barbour Fund (1923) | 10,000.00 |
| | <hr/> |
| | \$928,370.00 |

The payments on account of the Museum are made by the Bursar of Harvard University, on vouchers approved by the Director. The accounts are annually examined by a committee of the Overseers. The incomes of funds which are restricted are annually charged in an analysis of the accounts, with vouchers, to the payment of which the incomes are applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund (about \$500.) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Woods Hole, the Stations at Bermuda, or the Tortugas.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of \$400, is assigned annually with the approval of the Faculty of the Museum, on the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who may have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

Applications for the tables reserved for advanced students at the Woods Hole Station should be made to the Faculty of the Museum before the 1st

of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

The income of the Whitney Funds can be applied for the care (binding) and increase of the Whitney Library.

The Alexander Agassiz Expedition Fund was bequeathed by Alexander Agassiz for the publication of reports on collections brought together by the expeditions with which he was connected.

The income of the Louis Cabot Fund can be applied to the purchase of books on travel, sport, and natural history.

The income of the William and Adelaide Barbour Fund is "expended wholly at the discretion of the Director of the Museum of Comparative Zoölogy * * * to increase the collections of the Museum either by exploration or the purchase of desirable material."

The following Publications of the Museum of Comparative Zoölogy are in preparation:—

Reports on the Results of Dredging Operations in 1877, 1878, 1879, and 1880, in charge of ALEXANDER AGASSIZ, by the U. S. Coast Survey Steamer "Blake," as follows:—

- A. MILNE EDWARDS and E. L. BOUVIER. The Crustacea of the "Blake."
- A. E. VERRILL. The Alcyonaria of the "Blake."

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieutenant Commander Z. L. TANNER, U. S. N., Commanding, in charge of ALEXANDER AGASSIZ, as follows:—

- | | |
|---|---------------------------------|
| K. BRANDT. The Sagittae. | H. J. HANSEN. The Schizopods. |
| K. BRANDT. The Thalassicolae. | W. A. HERDMAN. The Ascidians. |
| O. CARLGREN. The Actinarians. | S. J. HICKSON. The Antipathids. |
| W. R. COE. The Nemertean. | P. SCHIEMENZ. The Pteropods and |
| REINHARD DÖHRN. The Eyes of Deep- Sea Crustacea. | Heteropods. |
| H. J. HANSEN. The Cirripeds. | THEO. STUDER. The Alcyonarians. |
| | H. B. WARD. The Sipunculids. |

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of ALEXANDER AGASSIZ on the U. S. Fish Commission Steamer, "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., Commanding, as follows:—

- | | |
|---|-----------------------------------|
| — The Volcanic Rocks. | G. O. SARS. The Copepods. |
| — The Coralliferous Limestones. | L. STEJNEGER. The Reptiles. |
| G. W. MÜLLER. The Ostracods. | T. W. VAUGHAN. The Corals, Recent |
| MARY J. RATHBUN. The Crustacea Decapoda. | and Fossil. |

PUBLICATIONS
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
AT HARVARD COLLEGE.

There have been published of the BULLETIN Vols. I. to LIV., LVI., and LVIII. to LXIV.; of the MEMOIRS, Vols. I. to XLII., and also XLIV. to XLVI., and XLVIII.

Vols. LV., LVII. and LXV. of the BULLETIN, and Vols. XLIII., XLVII. and XLIX. of the MEMOIRS, are now in course of publication.

The BULLETIN and MEMOIRS are devoted to the publication of original work by the Officers of the Museum, of investigations carried on by students and others in the different Laboratories of Natural History, and of work by specialists based upon the Museum Collections and Explorations.

The following publications are in preparation:—

Reports on the Results of Dredging Operations from 1877 to 1880, in charge of Alexander Agassiz, by the U. S. Coast Survey Steamer "Blake," Lieut. Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding.

Reports on the Results of the Expedition of 1891 of the U. S. Fish Commission Steamer "Albatross," Lieut. Commander Z. L. Tanner, U. S. N., commanding, in charge of Alexander Agassiz.

Reports on the Scientific Results of the Expedition to the Tropical Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander Jefferson F. Moser, U. S. N., commanding.

Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer "Albatross," from October, 1904, to April, 1905, Lieut. Commander L. M. Garrett, U. S. N., commanding.

These publications are issued in numbers at irregular intervals. Each number of the Bulletin and of the Memoirs is sold separately. A price list of the publications of the Museum will be sent on application to the Director of the Museum of Comparative Zoölogy, Cambridge, Mass.